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EWN/RSM Principles and the Missouri River Effects Analysis

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US Army Corps of Engineers®

Background (Way Back)

Background (Contemporary)

Missouri River Recovery Program

Management Plan:

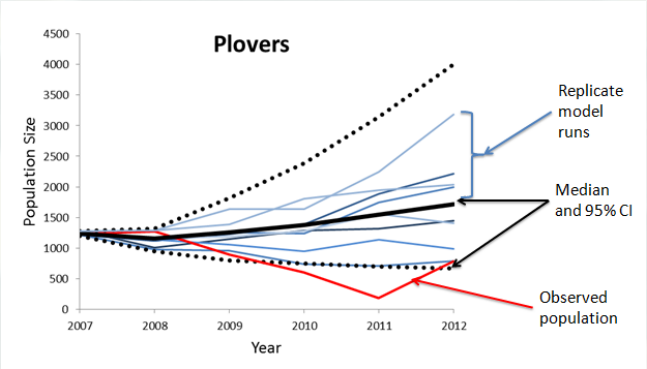
- The scope of the effort is **focused on removing or precluding jeopardy status and contributing to the recovery** of the three species.
- Identify preferred alternative to be implemented within an adaptive management framework, collaborate with stakeholders and **fulfill NEPA requirements**.
- The Plan will be completed **within 3 years**.

Effects Analysis:

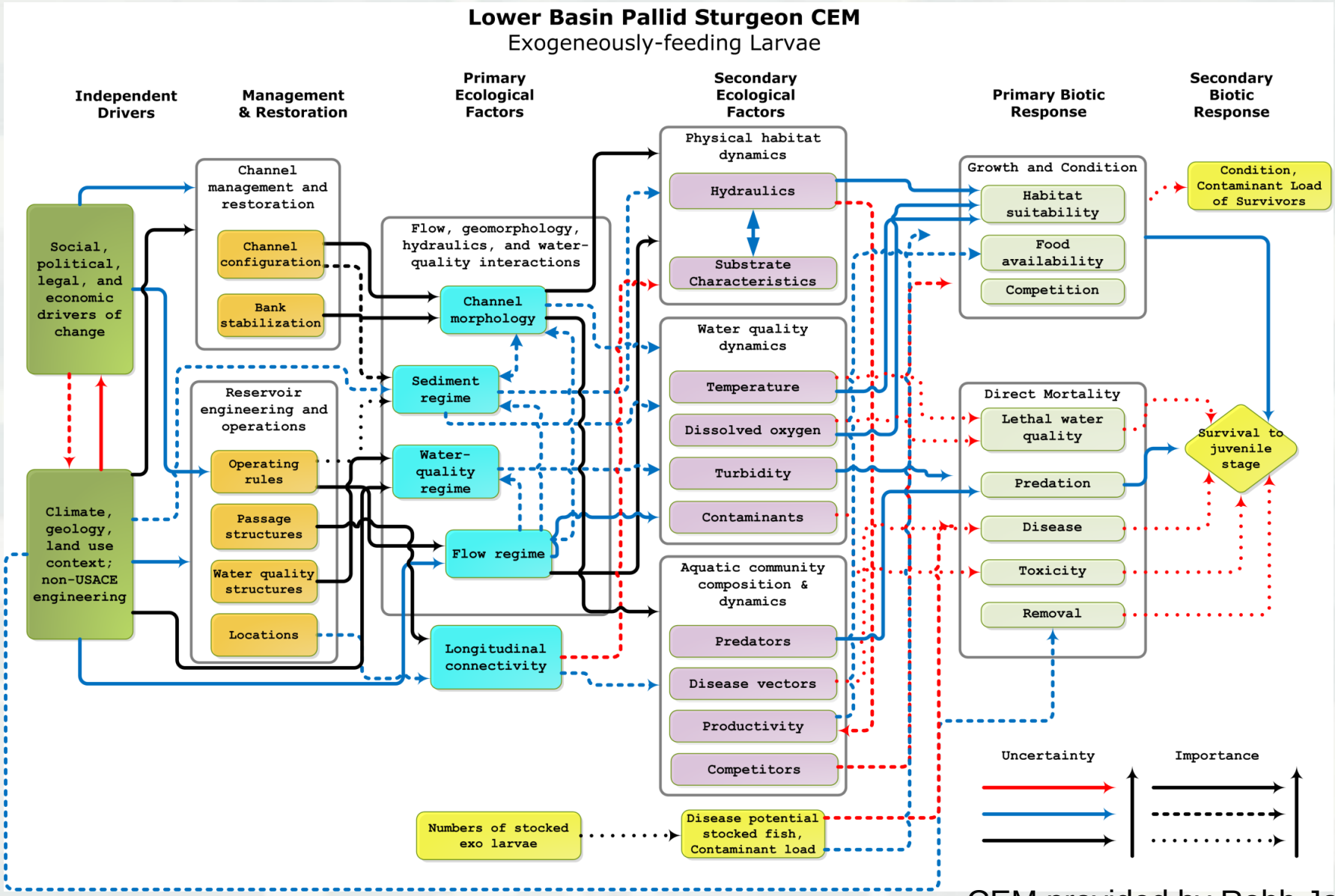
- Provides a mechanism for **quantifying the effects of past, ongoing and future USACE actions** on the 3 listed species and evaluating the potential benefits of proposed management actions

Effects Analysis Overview

- Three Modeling Teams: H&H/Geomorphology (AKA Habitat Team), Bird Team, Sturgeon Team
- Approach:
  - ▶ Literature/Data Assessment
  - ▶ Conceptual Model Development
  - ▶ Development of Hypotheses
  - ▶ Model Development
  - ▶ Preliminary Analyses
  - ▶ Alternative Assessment
- Other Considerations:
  - ▶ ISAP/SAM/MRRIC Interaction
  - ▶ Management Plan Support

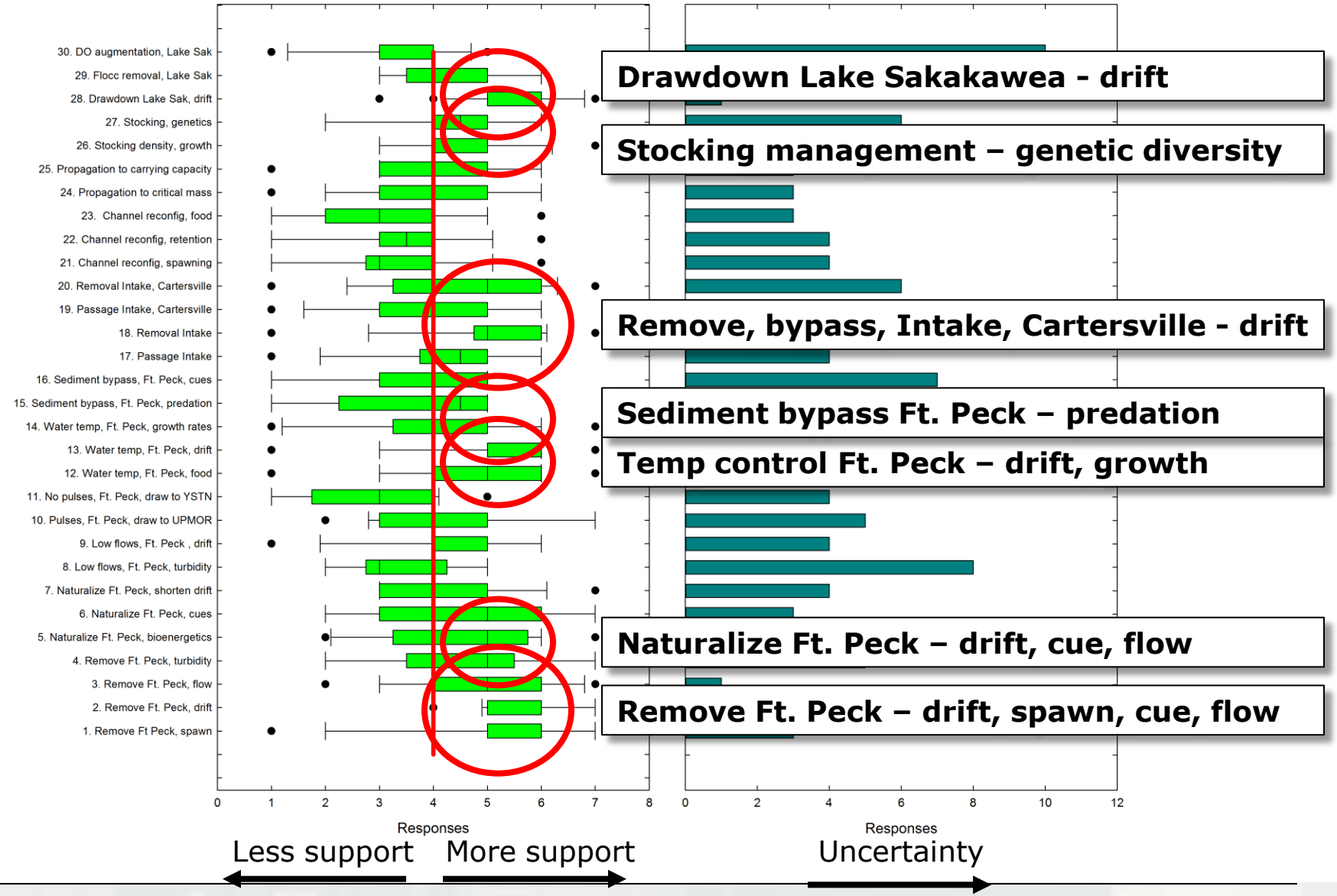


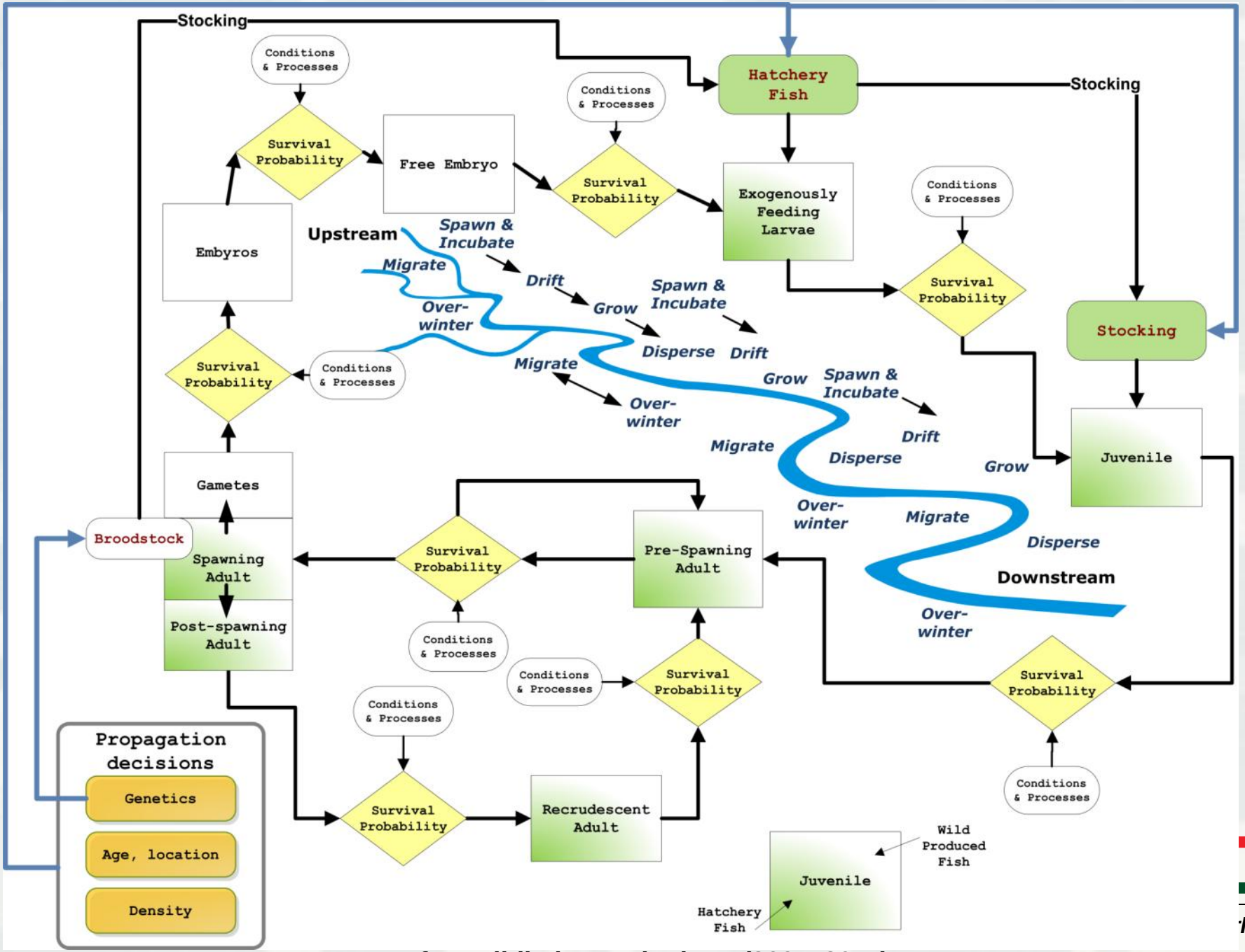
Conceptual Models



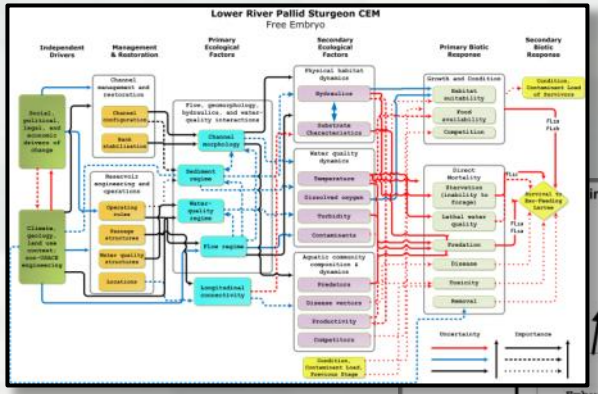
CEM provided by Robb Jacobs

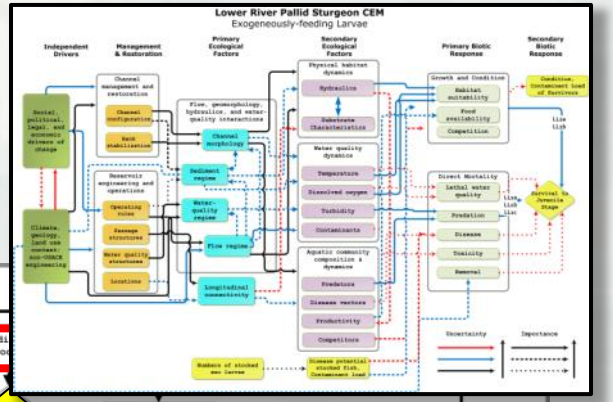
Management Hypotheses Expert Survey

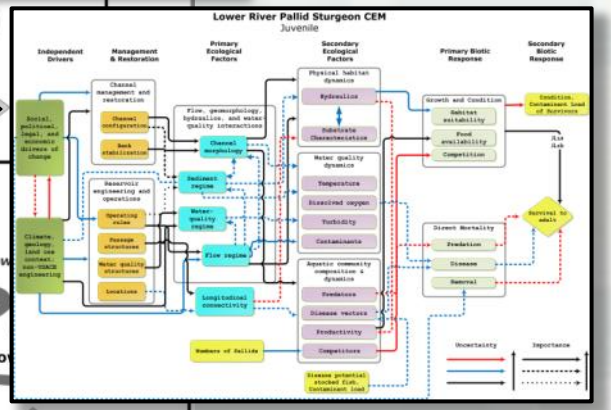


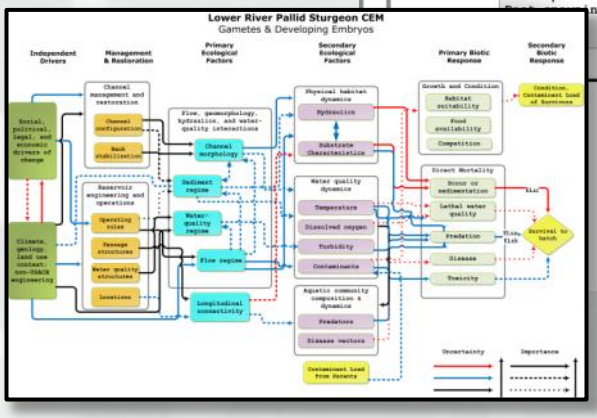


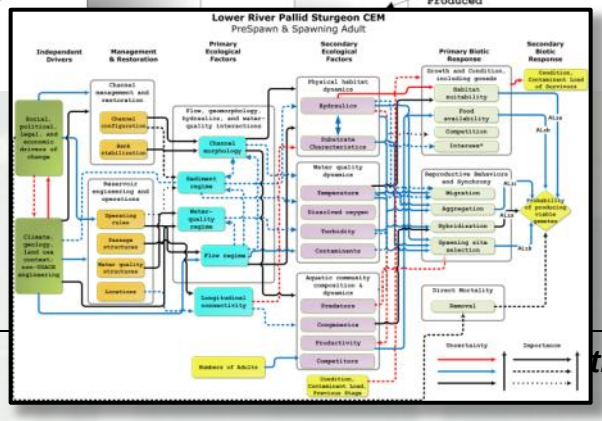
After Wildhaber and others (2007, 2011)

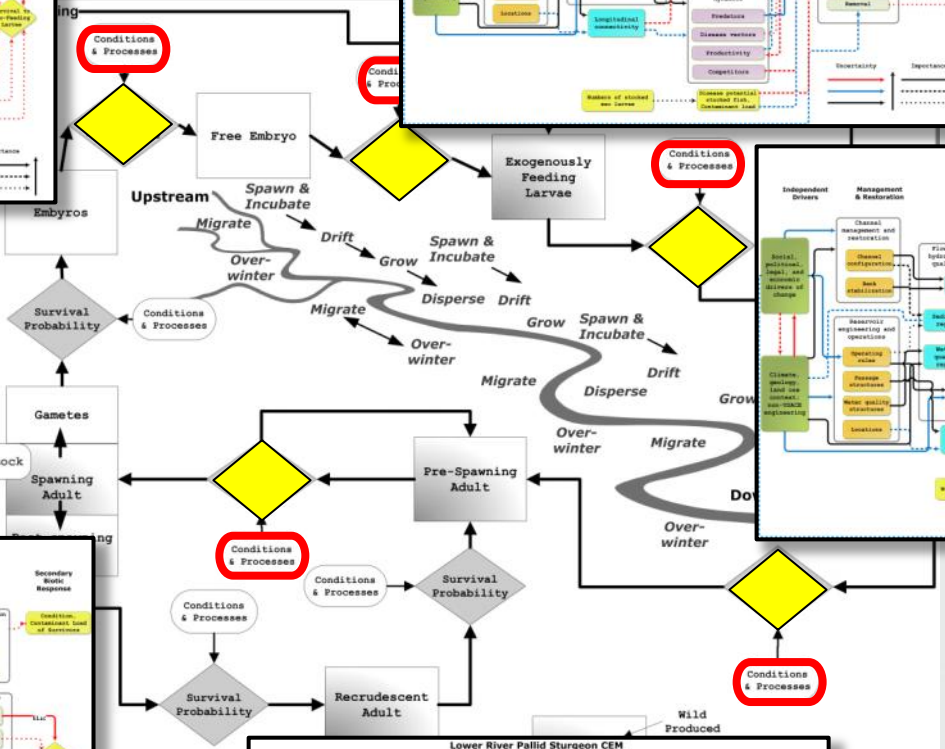












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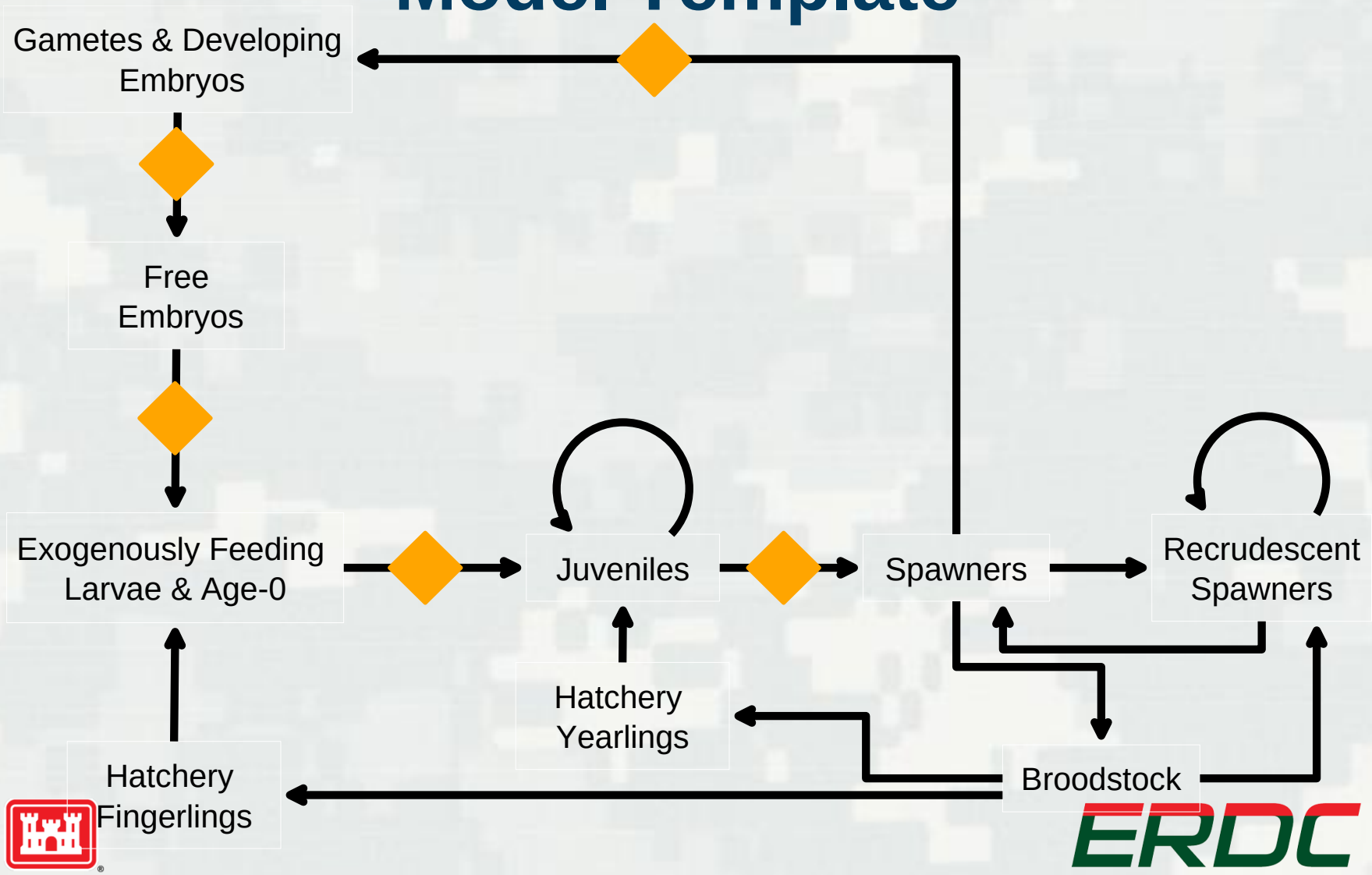
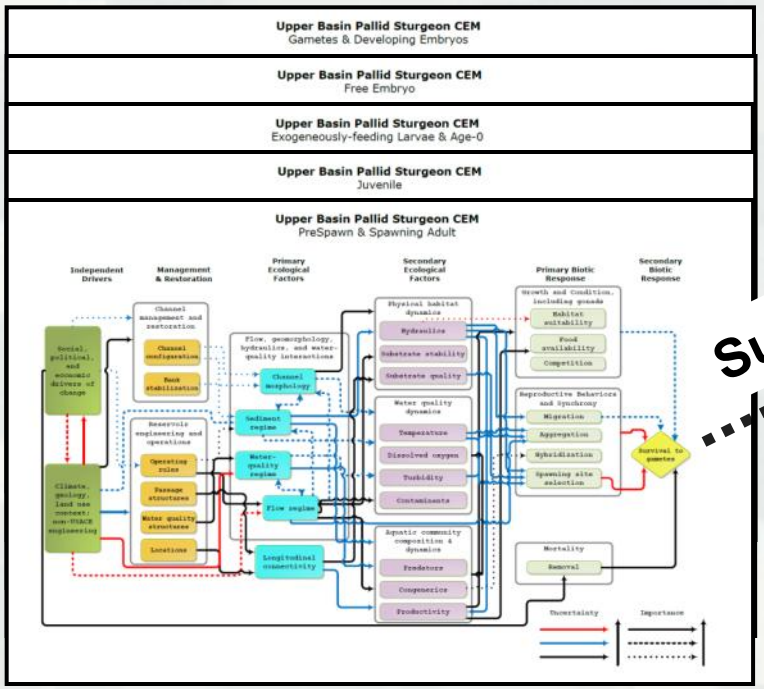
A Stage Structured Population Model Template



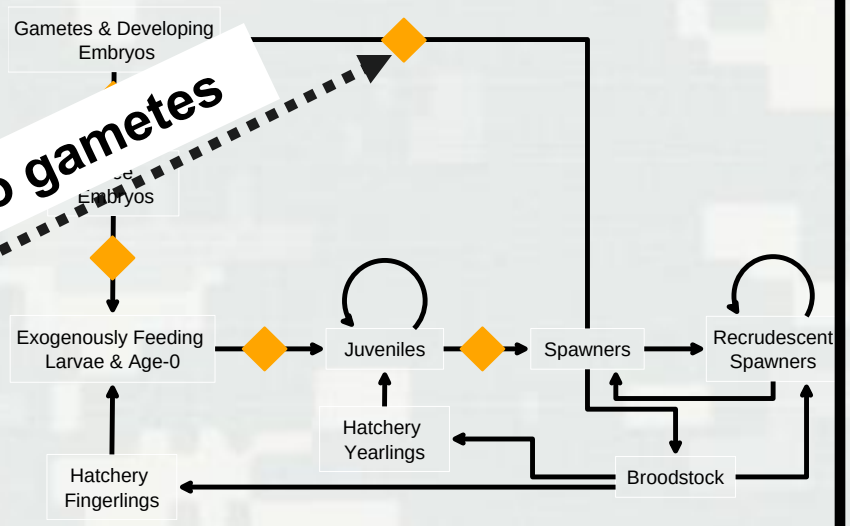
Plugging in CEMs

Conceptual Ecological Models (CEMs)



Survival to gametes

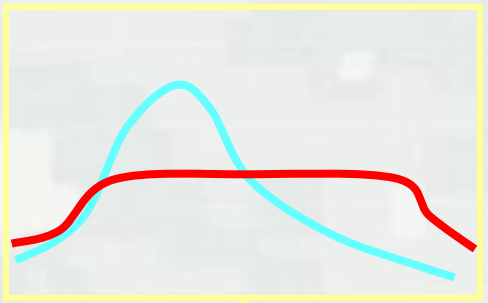
Stage Structured Population Model



Integration with Hydrology & Hydraulics

Two interacting USACE management actions:

FLOW REGIME



± temperature, sediment

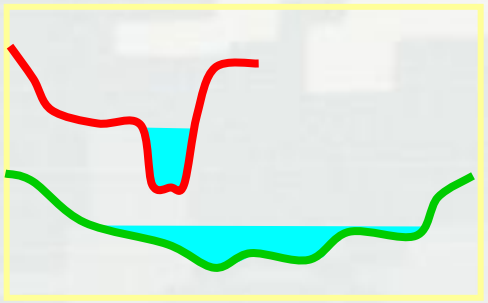
± other interacting variables

INSTREAM HYDRAULICS

Computational model: physical habitat in time and space

Growth, condition, mortality, & reproduction

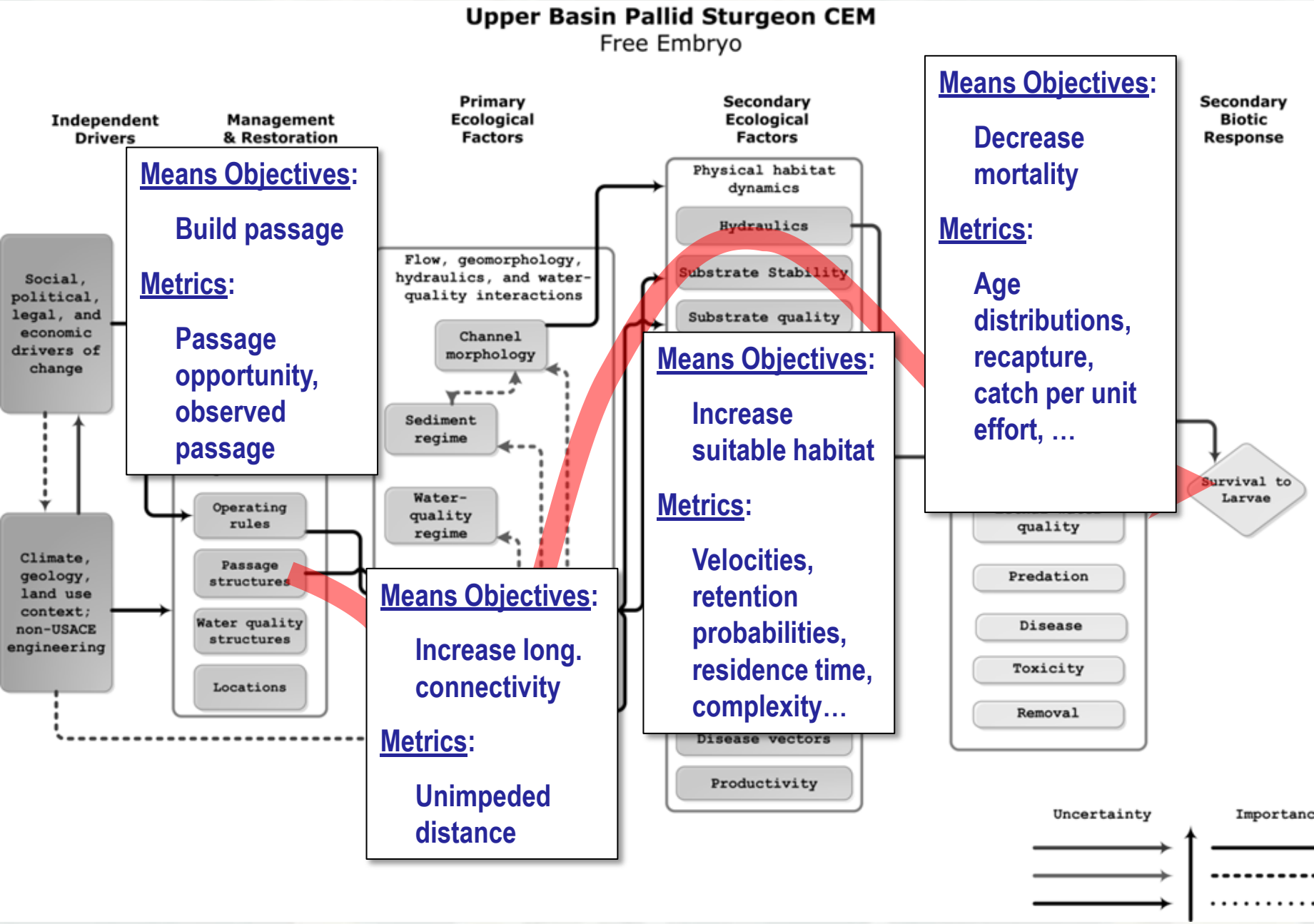
Survival probability at given stage



CHANNEL FORM

Can we define robust habitat metrics to model as means objectives for survival?

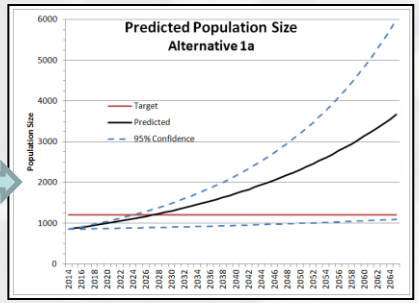
Means Objectives: Population Inferences

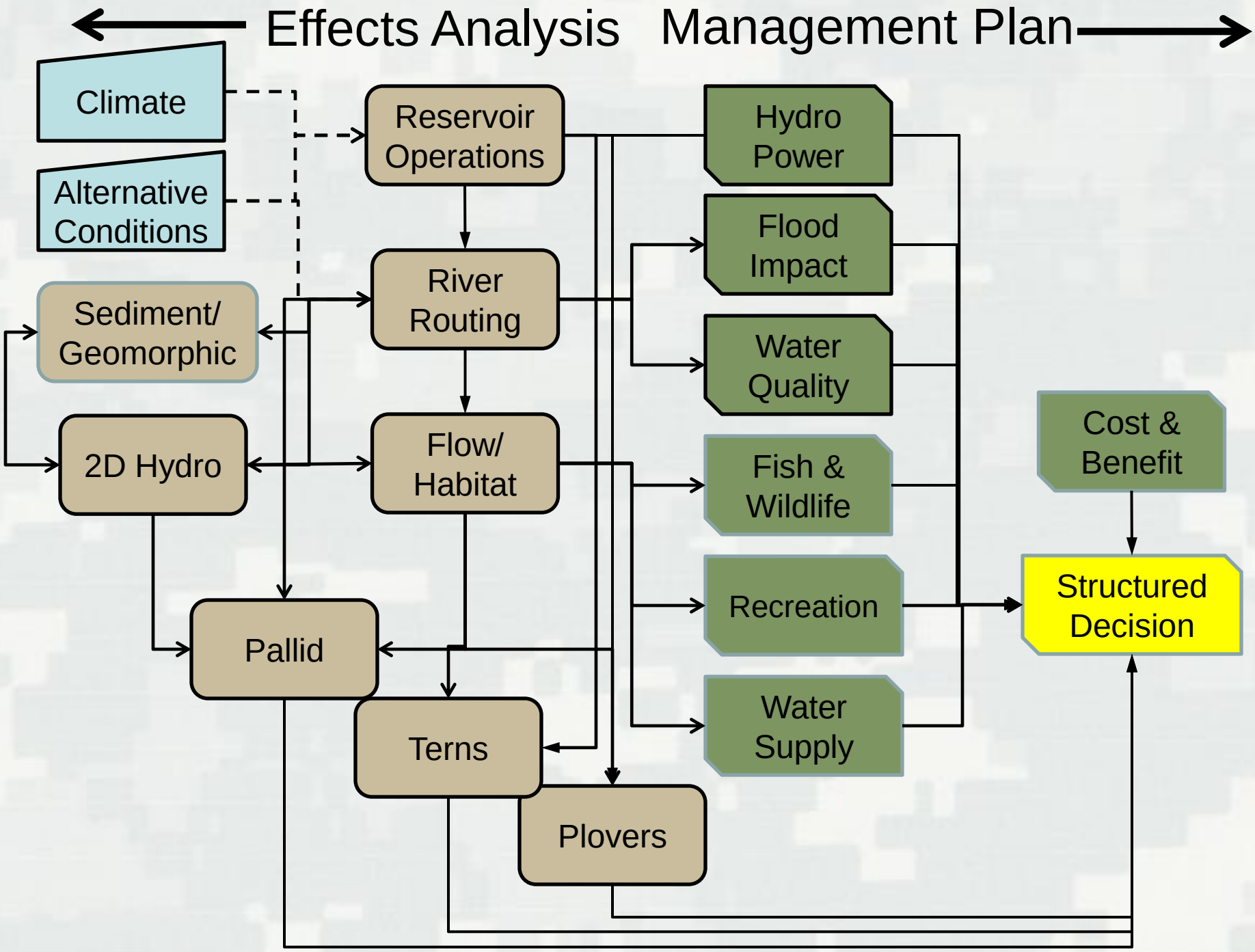


Assessing Alternatives

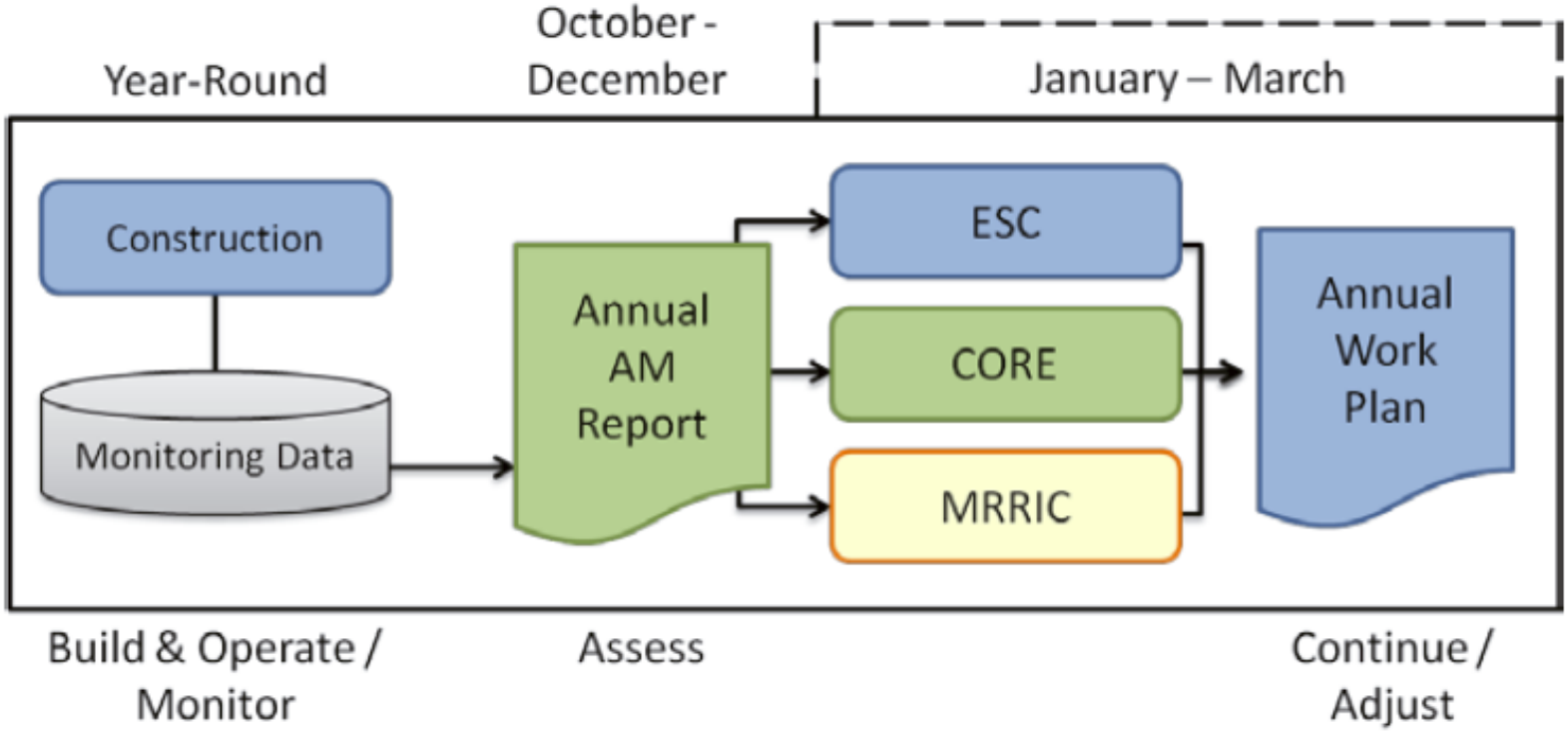
Charge:

1. Provide necessary inputs to the species models by simulating changes in habitat conditions associated with natural variability and management action implementation.
2. Explore useful relationships, identify critical thresholds and help quantify uncertainty through sensitivity and scenario analyses.




Effects Analysis
Management Plan
Climate
Alternative Conditions
Reservoir Operations
River Routing
Flow/ Habitat
Sediment/ Geomorphic
2D Hydro
Pallid
Terns
Plovers
Hydro Power
Flood Impact
Water Quality
Fish & Wildlife
Recreation
Water Supply
Cost & Benefit
Structured Decision

AM Implementation Cycle
(from MRRP AM Process Framework)



EWN Essential Elements

- ✓ Use science and engineering to produce operational efficiencies supporting sustainable project benefits.
- ✓ Use natural processes to maximum benefit, thereby reducing demands on limited resources, minimizing the environmental footprint of projects.
- ? Broaden and extend the base of benefits provided by projects to include substantiated economic, social, and environmental benefits.
- ✓ Use science-based collaborative processes to organize and focus interests, stakeholders, and partners to reduce social friction, resistance, and project delays while producing more broadly acceptable projects.

EWN Principles

- ✓ **Holistic** – an ecosystem approach for planning, designing, constructing and operating projects where social, economic and environmental factors are equitably weighed in the decision making process.
- ✓ **A Systems Approach** – reflecting the reality that USACE projects exist in complex physical and social/cultural systems, and that a single action influences many other parts of the system.
- ✓ **Sustainable** – focused on the long-term sustainability and resilience of project solutions and the benefits streams provided by the system over time.
- ✓ **Science-based** – built on first understanding, then working deliberately with natural forces and processes to accomplish engineering goals.
- ? **Collaborative** – based on effective partner and stakeholder communication, engagement and collaboration through the entire life cycle of a project, beginning at the earliest conceptual stages.

EWN Principles (concluded)

? **Efficient and cost effective** – reducing time and rework, while minimizing social friction.

✓ **Socially responsive** – aligned with the values, objectives, interests and priorities of USACE, partners, stakeholders and society at large.

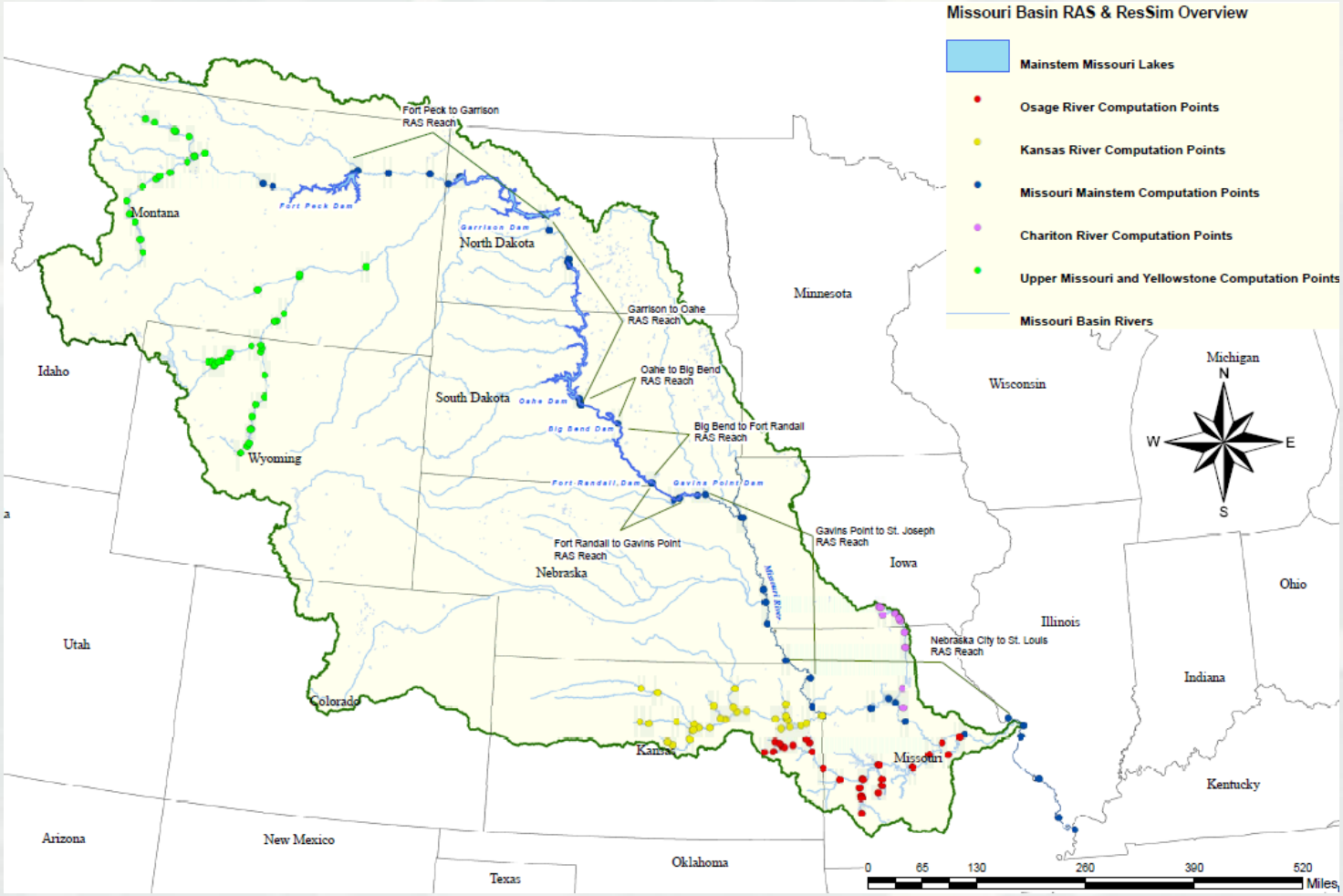
✓ **Innovative** – embracing new and emerging technologies and incorporating continuous learning, technology transfer and adoption of new and leading practices.

✓ **Adaptive** – demonstrating adaptive attitudes, structures and processes that enable a living, evolving and sustainable practice.

Key RSM Considerations

- View sediment as a critical resource
- Includes “pilot projects” with upscaling through monitoring and adaptive management
- Optimizing reservoir operations to manipulate downstream sediment processes (regionally)
- Assessing impacts of reductions in sediment bed material load and turbidity (SS conc.)
- Long-term sediment supply for creation of ESH
- Sediment capture for creation of SWH
- Potential for shoaling, channel degradation and other sediment impacts or benefits
- Sediment yield to downstream systems not addressed

Discussion


Missouri Basin RAS & ResSim Overview
Mainstem Missouri Lakes
Osage River Computation Points
Kansas River Computation Points
Missouri Mainstem Computation Points
Chariton River Computation Points
Upper Missouri and Yellowstone Computation Points
Missouri Basin Rivers
Fort Peck to Garrison RAS Reach
Garrison to Oahe RAS Reach
Oahe to Big Bend RAS Reach
Big Bend to Fort Randall RAS Reach
Fort Randall to Gavins Point RAS Reach
Gavins Point to St. Joseph RAS Reach
Nebraska City to St. Louis RAS Reach
Fort Peck Dam
Garrison Dam
Oahe Dam
Big Bend Dam
Fort Randall Dam
Gavins Point Dam
Montana
North Dakota
South Dakota
Minnesota
Wisconsin
Michigan
Idaho
Wyoming
Nebraska
Iowa
Illinois
Indiana
Ohio
Kentucky
Missouri
Kansas
Colorado
Utah
Arizona
New Mexico
Texas
Oklahoma
N
S
E
W
0
65
130
260
390
520
Miles